rWeather

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Correction: The URL for the rWeather Web site was incorrectly published with a <www> in the previous newsletter. The correct URL is <test.wsdot.wa.gov/rwis>.

On-line weather guide will help readers understand weather and interpret forecasts

An important aspect of the rWeather program is to help people understand weather phenomena and basic weather concepts and terminology. To do that, weather experts at the University of Washington are developing an on-line road and weather guide. The guide is meant for non-meteorologists, such as Washington State Department of Transportation maintenance personnel and the public. Maintenance personnel should benefit from a better understanding of the physical dynamics behind the weather that affects their operations. The travelling public can benefit from a better ability to interpret weather information and how it might affect their travel plans.

The weather guide is being developed one chapter at a time, each chapter devoted to a specific weather feature. Topics that will be covered include roadway icing, visibility, snow, rain, and wind. A glossary of terms will also be available, with links from the text to the glossary. Each chapter will be self-contained and independent of the others, so that readers can focus on a weather topic of interest. The format of the chapters will follow a consistent structure, with an introduction to the subject, an explanation of the mechanics of the weather phenomenon, and some suggested responses to threats the weather may pose.

As chapters become available, links will be placed in the rWeather Web page. The first chapter on roadway icing is now available at <www.atmos.washington.edu/~cliff/ Roadway.html> and from the rWeather Web site at <test.wsdot.wa.gov/rwis/default.htm>.

For more detailed information about the rWeather project see Volume 2 of this newsletter.

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Foretell

Foretell is a multi-state field operational test funded by the Federal Highway Administration's Rural Intelligent Transportation Systems program. And like the rWeather project, it is combining intelligent transportation and weather prediction systems to create an advanced highway maintenance management and traveler information system.

As envisioned, Foretell will serve as a one-stop, seamless information source. Right now, developers are working to fill the gap between currently available road-weather information and the information that transportation operations and maintenance personnel need to more effectively and efficiently maintain the roadways. Eventually, the target audience will be expanded to include emergency management and the public. Through Foretell, these groups will be able to access information on a wide range of weather and pavement conditions for any road or region in their state.

The Foretell concepts are being tested in five states in the Mississippi Valley region, plus western Ontario. The program touches on the major metropolitan areas of Chicago, Milwaukee, Minneapolis/St. Paul, Kansas City, and St. Louis and reaches a total population of over 40 million. The Iowa Department of Transportation is the public sector lead, and Castle Rock Consultants is the private sector lead. Major partners in Foretell include state governments, private entities, Canadian agencies, and the U. S. Department of Transportation.

The Need for Better Information

Maintenance officials have long known that subtle differences exist between weather conditions and road conditions. Sources of weather information have been available to maintenance personnel for decades, while manual observations by maintenance personnel have been the main source of road condition information. Foretell seeks to change this.

Foretell will provide detailed road and weather condition information to maintenance staff. Surveys and interviews with maintenance operators and managers from Foretell states have identified crucial information that affects their ability to perform their duties. More effective timing of forecasts, critical temperature thresholds, more accurate estimates of storm start and end times, and more detailed road and weather condition parameters are just some of the information that maintenance personnel need.

Developers are also working with emergency management personnel to determine the information they need most.

Road and weather conditions will be determined by using data integrated from road-

weather information sensors, mobile platforms, personal observations, and mesoscale weather data to provide forecasts at greater levels of detail than currently available.

Weather

Foretell combines two sources of weather information to provide the most recent and accurate data available. The first source of information is the 24-hour forecast created by National Weather Service computers and other sources. These forecasts will be updated four times a day, at 3:00 AM, 9:00 AM, 3:00 PM and 9:00 PM (Central Standard Time). These forecasts will be segmented into hourly intervals and will provide state and local maintenance personnel with the opportunity to gauge the severity of an approaching winter storm and determine an appropriate operational strategy.

The second source of information provided by Foretell is the "nowcast." A nowcast is a display that shows current weather conditions over an entire region. These nowcasts will be updated every hour.

These forecasts and nowcasts will give maintenance personnel continuously updated detailed road and weather condition information. This will ensure that operational decisions can be modified throughout the life of a storm to make most efficient and effective use of the available resources.

Roadways

Foretell is also developing and deploying next-generation pavement forecasts by using energy balance, solar gain, and cross-wind models to predict roadway conditions. Foretell's mobile platforms—GPS-equipped vehicles with the capability to collect and transmit air temperatures, wind speeds, pavement data, and maintenance operations reports in real time via satellite data links—will expand the information base for detailed road-weather condition forecasts.

The Foretell Web Site

Foretell is an Internet-based system that can be accessed with Internet Explorer or Netscape. Because it is currently in the demonstration phase, the Web site can be accessed only by Foretell partners with approved IDs and passwords.

Foretell's main screen map will display all of the states participating in Foretell and the Interstates running through each. Users will use pan and zoom controls to select the geographic area for which they need information, such as a region, county, city, or

roadway.

Foretell will enable users to view forecasted weather and road conditions for the current time and up to 24 hours into the future.

Foretell will display color-coded forecasts for the following weather conditions:

precipitation, temperature, dewpoint, humidity, wind speed and direction, radar, cloud thickness, atmospheric pressure, 24-hour accumulation of precipitation, and 24-hour accumulation of frozen precipitation.

Foretell will also display roadway information for the following conditions: road driveability based on forecasted conditions, air temperature 5 feet above the road surface, road pavement temperature, road dewpoint, road freeze point, and road snow depth.

Clicking an Animate button after selecting a road or weather display will trigger an animation of the forecasted conditions, with one frame corresponding to each of the 24 hours covered by the forecast.

Another key feature of Foretell is that it will allow users to create graphs of the forecasted conditions over a 24-hour period for any point along the roadway.

Foretell will also disseminate information that transportation agencies input with the Condition Acquisition Reporting System (CARS). Transportation departments will be able to enter current information about situations such as road work or accidents. An icon representing that situation will then appear on the map.

Benefits

As one of the first major rural ITS initiatives in the United States, Foretell is playing a major role in the development of rural ITS architecture. Overall goals include reducing deaths related to winter road conditions by at least 15 percent within five years. John Whited, program manager of advanced transportation technology, Planning and Programming Division, Iowa Department of Transportation, believes that this is a realistic goal for Foretell. It assumes that the traveling public will have access to the Foretell Web site, perhaps even in their cars as technology evolves. “We think that better information and education will allow people to change their travel patterns. In addition, reducing any amount of travel in hazardous areas increases safety because there are fewer people to run into.” In the meantime, maintenance departments’ access to better road and weather information will help them maintain roads in safer condition.

Whited said that in the next phase of the project, developers will create a road condi-

tion index for public use. This index will be based on input from road maintenance personnel and computer models and will produce colors on a map to indicate how risky or hazardous driving is on any road.

Foretell will assist transportation agencies by providing information tailored to meet their specific needs, thereby helping them to use labor, equipment, and materials as cost effectively as possible. For example, by knowing when and where freezing precipitation will occur, maintenance forces will be able to anticipate how much labor and what kinds of equipment and materials will be needed to deal with the anticipated weather and accumulation. Associated benefits will include the following:

- input to decision making processes related to highway operations and maintenance
- shared data resources among state, federal, and local transportation agencies
- the ability to translate the weather and pavement condition information into advisories for the driving public
- savings from reduced overtime and crew call-outs
- less chemical and material usage and more effective maintenance strategies
- increased management efficiency in costly winter maintenance and annual repai rehabilitation programs.

In addition, better winter and road maintenance operations will benefit the economy, environment, and the traveling public. These benefits will include

- more efficient traffic throughput during inclement weather
- reduced salt and other chemicals entering streams and soils
- faster response to weather related emergencies
- fewer closures for businesses and absenteeism of workers.

A major program goal is to create a viable road and weather information network that will be adopted across the continent within five years. Whited says that Fortell will be

CARS adds more details to the weather and roadway picture

Once weather and road conditions are available at one Web site, everyone from maintenance operators to the public will be able to easily obtain more comprehensive roadway information. But weather and road conditions are still only part of the whole picture.

Incidents, construction, special events, and maintenance activities also affect road travel. To make this type of information available, a program has been developed called CARS (Condition Acquisition and Reporting System).

CARS is a standardized way for transportation department personnel to manually input and share information about traffic, incidents, construction, closures, and other activity on the roadway. CARS was developed by Castle Rock Consultants within a pooled fund study.

The program offers a series of windows, pull-down menus, and standardized options for entering information about any event or condition, including route, location, and starting and ending time, as well as other descriptive details. Once structured, the data can then be imported into other programs such as the Washington State Department of Transportation's (WSDOT) rWeather or Foretell in the Midwest. At these Web sites, users will be able to click on icons to find detailed information about an incident, construction, or other conditions.

An interface between the rWeather Web page and CARS has been developed, and a beta site is testing the inclusion of CARS information on the rWeather page. William W. Brown, transportation engineer with the Washington State Department of Transportation's Advanced Technology Branch, says that WSDOT views CARS as a way to standardize the entry of roadway information about all Interstates and highways across the state. Authorized personnel such as construction project managers, radio room personnel, and others can log on to a central Web site and input the data.

CARS will also be used to put incident information on the Foretell Web site. Developers at Iowa Department of Transportation are working with a group of other states to make this tool more widely useful. According to John Whited, program manager of advanced transportation technology, Iowa DOT's Planning and Programming Division, some states have asked to include parking information, while others have requested information about when the DOT will be plowing, sanding, or salting roads.

At WSDOT, dispatch center operators have begun to input CARS data, and Washington State's version of the program is about 80 percent functional, says Brown. The operators find the program useful as a log for tracking highway-related communications among DOT and state patrol personnel. Don Hewitt, dispatch communications supervisor with WSDOT, is pleased that the Internet-based system will allow operators in different locations to enter information into the same log. However, testers and programmers are still reporting and addressing a few functional problems. Trials have revealed that the program is too complex and time-consuming for dispatch operators to use effectively during times of high activity. Castle Rock Consultants is working closely with WSDOT to address the problems uncovered in these first user tests.

The next step at WSDOT, which will begin this summer, will be to familiarize construction personnel with the program.

Perhaps more of a challenge than completing the design of the program will be addressing necessary institutional changes, says Brown. Personnel who have never before had to consider the traveler information aspects of their work, such as dispatch center operators, must now add the task of entering CARS data to their list of duties. They must be persuaded that the public, not to mention other DOT departments, want and need this information. And they need to be shown that the effort of using CARS is worth the payoff in increased public goodwill and safety and improvements in departmental cooperation and coordination.

For more information about the use of CARS at WSDOT, contact William Brown at (206) 616-9183, <wwbrown@u.washington.edu>, or Dean Deeter, Castle Rock Consultants, at (503) 636-4899.

To discuss any of the information in this newsletter contact Bill Brown by email: <wwbrown@u.washington.edu> or by phone: (206)616-9183.

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